

Integrating GIS and Cultural Resources Databases for Archeological Site Monitoring

The National Park Service, Western Archeological and Conservation Center (WACC) has developed a GIS and database system that allows parks to better manage cultural resources by linking all available descriptive data and graphics into a unified desktop computer system. The system is WACC's Integrated Cultural Resources Databank (ICRD). The ICRD was developed as a tool for managing prehistoric and historic-period archeological resources, and it can aid in the protection and monitoring of those resources.

For many national parks with threatened cultural resources, systematic archeological site monitoring programs generate necessary information that aids resource managers in effectively planning and budgeting for site preservation, protection, and archeological data recovery. The purpose of site monitoring programs is grounded in the National Park Service's mission to preserve and protect those resources. However, many sites on park lands have never been revisited by archeologists or other resource management professionals subsequent to their original discovery and documentation. Only 27 percent of the National Register eligible sites in the Archeological Sites Management Information System (ASMIS) database for 17 Pacific West and Intermountain Region parks have been revisited since they were first documented. This is due in part to limitations on staff and funding, but also is in part the result of the absence of clear monitoring goals and effective, usable monitoring systems. The WACC system is one tool that can partially overcome these limitations. Baseline site data including professional recommendations can provide managers with consolidated information to better identify and prioritize monitoring activities for at-risk sites, so that it may not be necessary to monitor all sites. However, data must be readily accessible. The ICRD system is a useful tool that

can provide accessible and unified cultural resources information at low cost.

When at-risk sites are identified, how can resource managers maintain, interpret, and use monitoring data? The ICRD system is based on a geo-referenced databank designed for managing Section 106 compliance and site monitoring. ICRD links archeological base maps, document archives, site maps, images, and collections data with archeological site data recorded in the ASMIS. Using industry standard, off-the-shelf database, GIS, and imaging software, NPS-standard archeological databases including the ASMIS, List of Classified Structures, National Register of Historic Places, and Automated National Catalog System (ANCS+) are integrated with state-level site data and archeological project data. Development of the system was supported by four Intermountain and Pacific West region parks, Amistad and Lake Mead national recreations areas, the Mojave National Preserve, and Death Valley National Park. Completion of additional systems is planned for four additional parks. The evolution and refinement of the system benefited from collaboration with NPS archeologists and computer specialists in the Intermountain System Support Office (Santa Fe) the GIS Field Technical Support Center (Albuquerque), and GIS specialists at Scientific Technologies Corporation (Tucson).

The ICRD originated as a database and GIS project for Amistad National Recreation Area (NRA), Texas. It is modeled on the paper system of archeological base maps and electronic databases that have been in use at WACC since 1979. The original WACC system linked information on archeological projects, sites, collections, archives, and compliance activities. The goal of the Amistad NRA project was and is to consolidate all descriptive and graphic data into a user-friendly system—in essence to automate the WACC Archeological Databank and link those

data with graphic files. When used at its full potential, the ICRD system provides resource managers with a tool to manage Section 106 compliance, track programmatic activities, project budgets, identify potential resource projects, monitor sites and changes in site condition, provide comprehensive information for making eligibility determinations, and identify preservation, protection, and maintenance priorities.

The ICRD is an ArcView-based interface for accessing both dynamic and static cultural-resources data in a drill-down system of maps, databases, and digital archives. Dynamic data are information that can be changed or updated (e.g., ASMIS site data, monitoring data, base maps). Static data are the archival information accessible from the system (e.g., digital site forms, sketch maps, and photographs). Three integrated components form the core of the system: the geographic, database, and digital imagery components.

The geographic component of the system is made up of dynamic data that includes maps and map themes, USGS quad maps, shaded-relief maps, archeological base maps, AutoCAD technical maps, and ARC/INFO coverages. In ArcView, a map theme is a layer or collection of geographic features and attributes. Accessing maps and themes in the ICRD's geographic component is accomplished with point and click navigation. Users navigate or "drill-down" from a small-scale (1:250,000) shaded relief map in the system's main view to large-scale USGS map quads (1:24,000), shaded relief maps, AutoCAD technical maps, ARC/INFO coverages, and other map themes.

The database component is comprised of data for map themes, as well as, dynamic external databases with archeological site, project, collection, and NAGPRA data. Pre-programmed ArcView menu, button, or switchboard selections allow ICRD users to plot sites, create site themes and legends, query and display site and project data, and go directly to external site, project, collections, and NAGPRA databases. The system draws on external data sources to plot, display, and query information. The system design permits users to add information in one place and one time only and to access or output that information from and to multiple sources. Users need only update or "feed" external databases, such as ASMIS or ANCS+, to bring current data into the system.

The imagery component of the system also provides both dynamic and static data. It combines photographs with scanned images of original site forms, site sketch maps and technical maps, site and project notes, and illustrations. From any site point or polygon plotted on a USGS quad map, shaded relief map or other map, users can link to the digital images for a particular site, thereby having most, if not all, site data available from a single desktop computer.

From a single site point or polygon on a map, ICRD users can drill-down to access a wide array of archeological data. This is particularly useful when current or historical data are needed for compliance or site monitoring purposes.

Once monitoring data are collected, they can be plugged into the system easily and, along with baseline site data, made directly accessible to resource managers. Once a monitoring program is in place, maintaining current data in a usable format is both a management and technical challenge. The flow of data from the field, to the office, to the computer system and back (out of the system) to park managers in a usable form must be standardized and user-friendly. The ICRD system is the repository for the information and allows integrated access to it.

Archeologists or cultural-resource specialists must develop a protocol for collecting the data, processing the paperwork and associated materials, and inputting the information into the system's constituent parts.

For example, baseline site data are collected during initial site documentation. State site forms and site sketch maps, artifact inventories, and photographs are primary information sources. Supplemental data, including ASMIS impact and condition assessment data, also can form part of the baseline site record. WACC field archeologists have collected ASMIS data since 1989. A simple one-page ASMIS Field Form is attached to state site forms for fieldwork. The two together provide baseline site information in the site database that can be output to required state and NPS paper and electronic formats. Collecting baseline ASMIS data including impact, condition, and research-potential assessments with a chronological record of monitoring, provides a comparative basis for subsequent monitoring activities. When used for site monitoring, these same data fields can be plugged back into the ASMIS database. Additional data fields can be added to suit specific needs. Although many

state site forms evaluate site impacts and condition, ASMIS provides the ICRD system with NPS-standard assessment values that are linked to the Government Performance and Results Act (GPRA) goals.

Ease of use and standardization are fundamental to the ICRD system. Both dynamic and static baseline monitoring and site data are accessible from multiple sources linked to the ICRD system. Static data are the digital archives. Digital images of original site forms, sketch maps, and photographs stored as Adobe Acrobat documents are linked to each site in the geographic component. Like paper archives, these documents provide access to primary source information and therefore can not be changed. For monitoring, they provide comparative information that is the basis for documenting physical changes at a site over time. Copies of archive documents can be printed from ICRD to provide reference in the field for site monitoring. New impacts to sites can be documented on monitoring forms and disturbances plotted on site map and photograph copies. The monitoring data are then entered into the system and the updated map and photographs are scanned and added to the system. A separate monitoring map and photographs may be scanned and continually updated through digitization. Links to the new map file are predefined; all the ICRD user must do is make the site trinomial the name of the scanned map file. Then from site point or polygon, ICRD users can display or print the original site map and documentation, current monitoring data from the ASMIS database, and the monitoring site map.

The ICRD system includes additional monitoring data links. Microsoft PowerPoint users can create monitoring slide shows from digital images of sketch maps, forms, and photographs. The slide show may include multiple photographs and maps accessible by mouse click from site points or polygons on USGS map quads. The click opens the Site Information Switchboard, and the user need only click the switchboard button labeled "Site Monitoring" to start the slide show. Links are predefined; the users identify the slide show by the site trinomial (temporary numbers may be substituted for trinomials) and store it a predefined directory.

There are numerous advantages to the ICRD system over a paper record system. All descriptive site and monitoring data, maps, and

graphics are easily accessible from a point or polygon on a USGS map quad or by site query. If the databases are updated, information also is updated in the GIS. Digital archives are easily accessible for reference and they can be used, printed, and copied without damage to the originals. There are few limitations to changing or updating slide shows, the digitized site monitoring maps, or the site and monitoring databases.

Integrating baseline site data, professional and management recommendations, with a geo-referenced system of maps, archives, and photographs, provides an easy-to-use yet powerful resource management tool. Overall, the design and use of ICRD supports GPRA goals to enhance cultural resources preservation, protection, and interpretation.

Steven M. Baumann is an archeologist with the Western Archeological and Conservation Center, NPS.

Grand Canyon NP Opens New Curatorial Research and Storage Facility

Grand Canyon National Park recently hosted an open house and ribbon cutting ceremony to celebrate the opening of its new Curatorial Research and Storage Facility. The park's Collection Storage Plan, prepared in 1989, recommended a new museum storage building to replace the sub-standard building which housed over 250,000 catalogued objects. Over a 10-year period, work on the new storage building was accomplished in stages as funding became available. The new facility features state-of-the-art environmental systems for heating and cooling, dust filtering, humidity control, fire detection and suppression, and interior and exterior security. The controlled climate storage is designed to help protect and preserve valuable artifacts such as the Thomas Moran paintings, split-twig figurines, archives documenting tourism development at Grand Canyon since the late 1800s, pioneer artifacts, Ancestral Puebloan pottery, 10,000-year-old giant sloth bones, and paleontology specimens from various layers of the canyon.

For further information, contact Sandra Perl, management assistant, Grand Canyon National Park.